

# ***TIRE*** ***DIVISION***

STRATEGIC AND TECHNOLOGICAL  
TIRE INNOVATION







# ***AUTOMATED TIRE HANDLING & STORAGE SOLUTIONS***

"

**WELCOME TO  
A NEW ERA OF  
PRODUCTION**

"

Cassoli, an Italian company established in 1943, is, today, an important partner for leading world-wide tire manufacturers. Manufacturing high quality tires requires the intelligent management of internal logistics, attention to product quality standards and competitive delivery times.

Cassoli systems, accurately designed and implemented with the best automation technologies, make it possible to obtain maximum return from tire processing, thereby accelerating production and delivery times while maintaining product quality in all the processing stages.

ISO 9001  
ISO 14001  
OHSAS 18001  
BUREAU VERITAS  
Certification

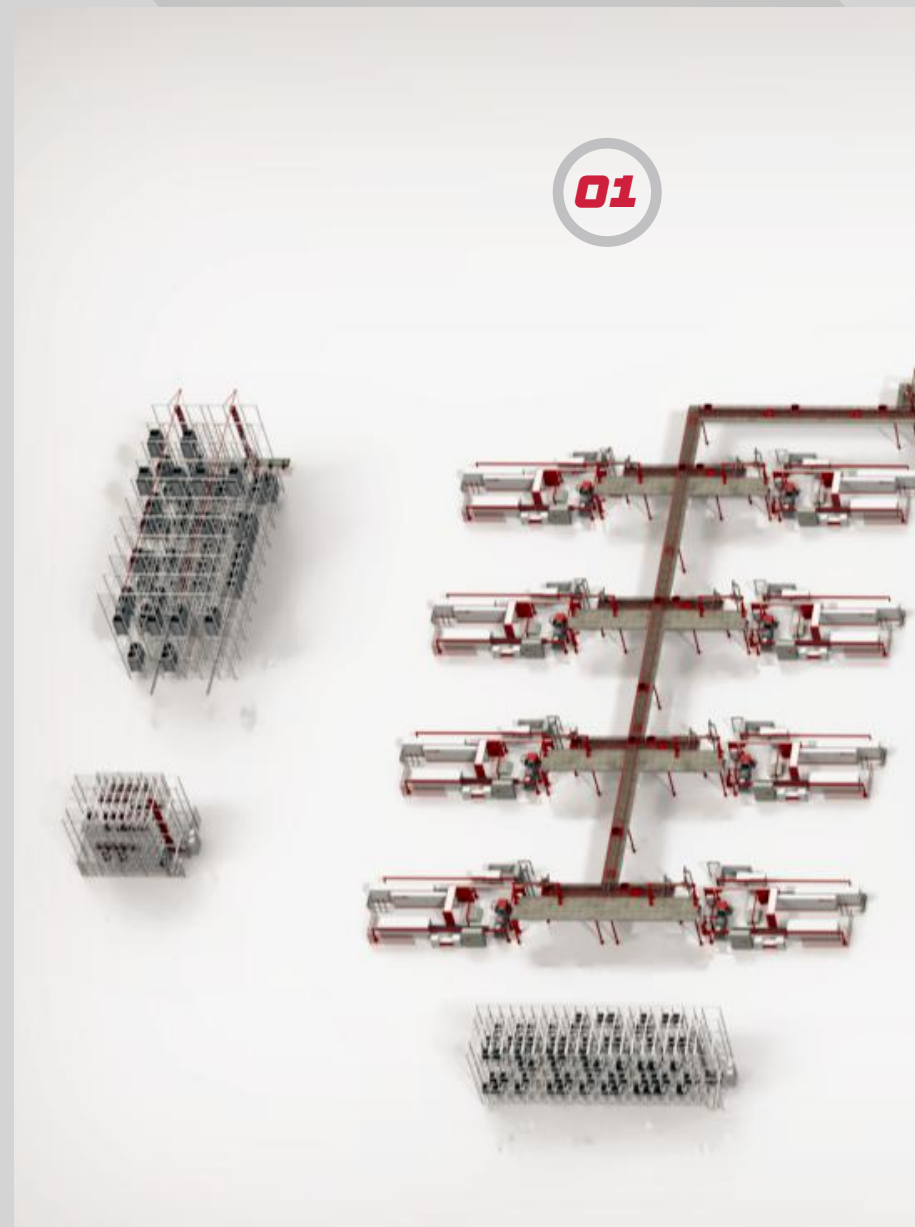




**01 TIRE BUILDING MACHINE AREA****02 GREEN TIRE STORAGE AREA****03 CURING AREA****04 QUALITY CHECK AREA****05 PALLETIZATION & BUFFERING AREA**

Cassoli services include development of the solution, layout design and simulation to verify the solution. Automation of the handling system from TBM (Tire Building Machine) to automatic storage of the finished product permits maximum use of all the system's machines, reducing production down-times or stoppages. Increasing the material flow to the presses is the key to maximizing production and saving time, all of which while ensuring a working environment that is safe and risk-free

for the operators; the continuous availability of tires for curing, makes it possible to make maximum use of the presses resulting in a substantial increase in production throughput. Technological innovation, research, reliability, user-friendly maintenance and flexibility are the major advantages that lead to the choice of a Cassoli system, a leader in the realization of manufacturing and distribution systems at the forefront of modern industry.

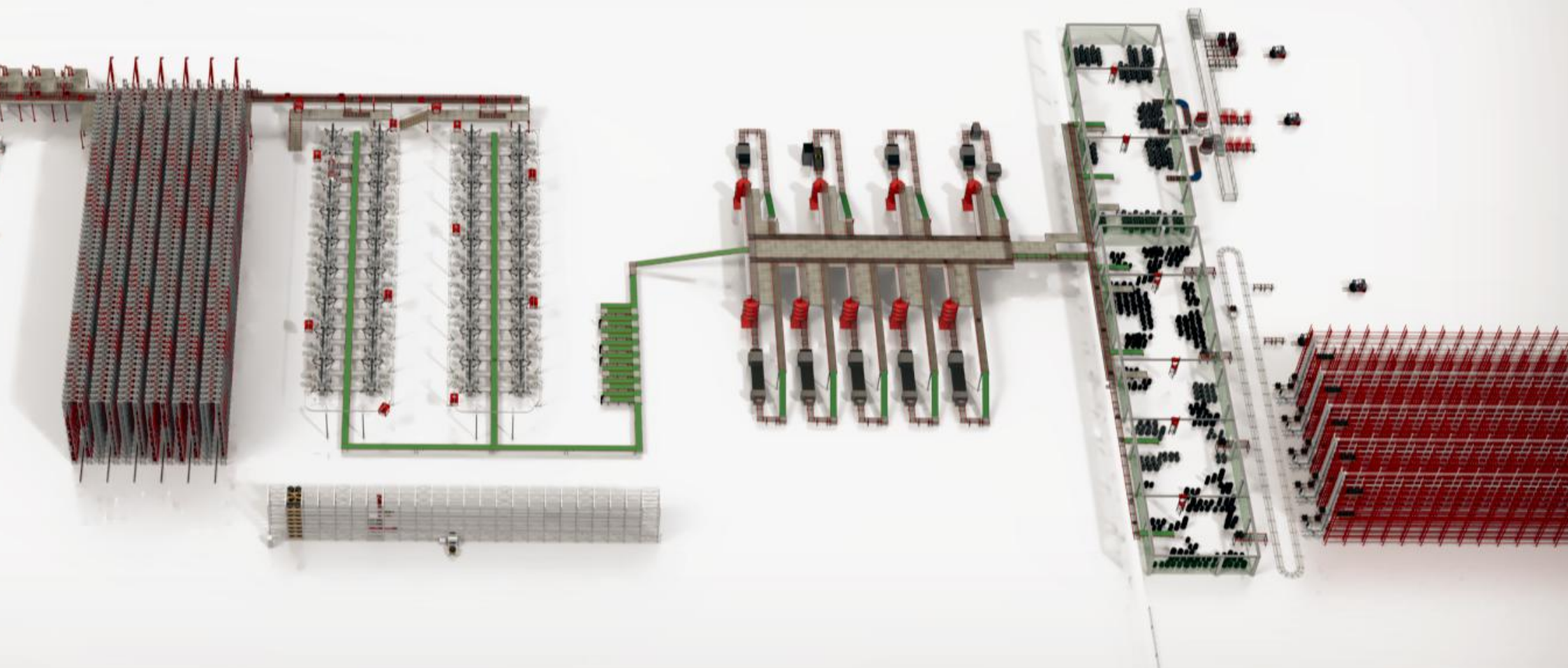
**01**

02

03

04

05



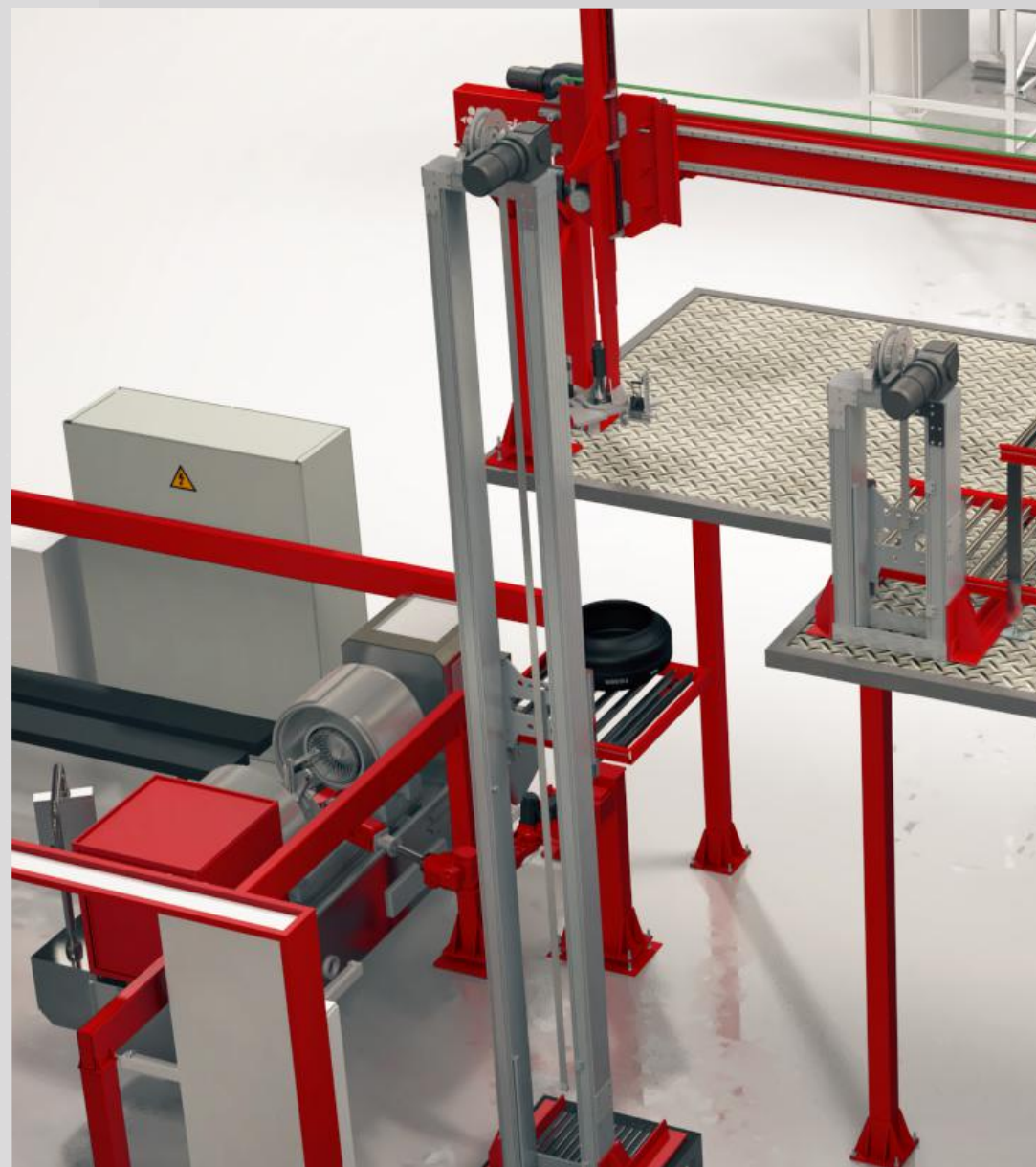
# 01

## TIRE BUILDING MACHINE AREA

Cassioli systems are the ideal solution to increase profit in companies specialising in tire production, since they enable creation of an excellent Green Tire (GT) buffer between the Tire Building Machine (TBM/TAM) and the presses, optimising material flow and considerably reducing waiting times.

The Green Tire handling system begins on TBM output, where each GT is positioned by a robot or a manipulator on a specifically shaped pallet

(Tote) or directly on the conveyor. The Green Tire then continues along a system of conveyors, up to Painting Machine, which treats it with a specific solution and, having completed treatment, is repositioned on the conveyor to then continue towards the automatic warehouse (Green Tire Storage Area).



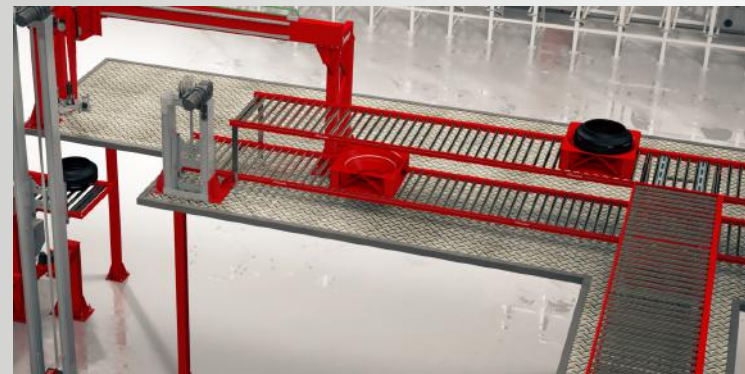




## ***VAST RANGE OF GT CONVEYORS WITH OR WITHOUT TOTE***

*Cassioli produces various types of automatic handling systems, including conveyor systems to enable Green Tire handling from one area to another in the plant. Based on customer needs and the characteristics of the production area, Cassioli will find the most suitable solution to guarantee rapidity and efficiency. For the conveyors, Green Tires can be transported both by tote/pallet and directly on a roller.*

### ***GT on tote/pallet***



### ***GT directly on conveyor***



# 02

## GREEN TIRE STORAGE AREA





## GREEN TIRE AUTOMATIC STORAGE

Having exited the TBM, the Green Tires are transported towards intermediate Green Tire warehouses, in standby for vulcanisation inside the presses. In fact, to have the presses running at full operation, the Green Tires are immediately available in the warehouse.

The high performance levels which can be reached, in terms of use in the intensive storage areas therefore justify implementation of the automatic warehouses with stacker cranes. Compared to manual storage systems, automatic warehouses guarantee higher load and handling potential and are therefore the ideal

solution in industrial plants specialising in tire production. The Cassioli Green Tire automatic warehouse is a fully customisable system, which allows you to arrange the storage units based on specific customer needs, in terms of space available, capacity and flows.

Cassioli experts make available four machinery ranges which, based on the manufacturer's needs, allow a highly customised solution to be obtained with optimised costs/benefits.

**STACKER  
CRANE**

**CARTESIO**

**CARTESIO VX**

**MULTI-LEVEL  
SHUTTLE**

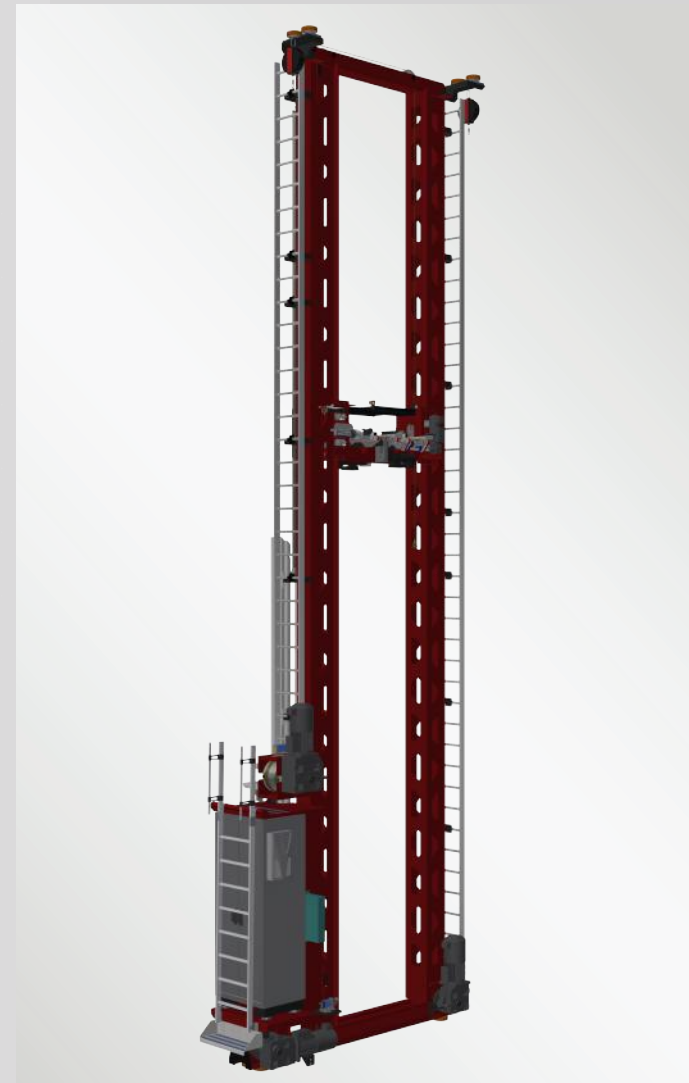
## **GREEN TIRE STORAGE WITH STACKER CRANE**

### **» Miniload Stacker Crane Double Mast**

Of the four possible, previously listed warehouse technologies, the stacker crane is the most common greenfield solution and where problems arise due to space between existing machinery.

To meet various flow and logical requirements of serving the presses, Cassioli designed two types of stacker cranes: single and double mast. Different loading configurations are available for each of them.

Stacker cranes can move up to four tires simultaneously; each fork however can be independent of the others, to guarantee maximum flexibility of even one batch.





## Picking system

GT without tote/pallet



CROSS  
TELESCOPIC  
FORK

GT with tote/pallet



STANDARD  
TELESCOPIC  
FORK

## Load Configuration



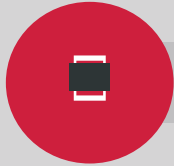
4 LOAD UNITS DOUBLE DEPTH



4 LOAD UNITS IN LINE



2 LOAD UNITS IN LINE



SINGLE LOAD UNIT

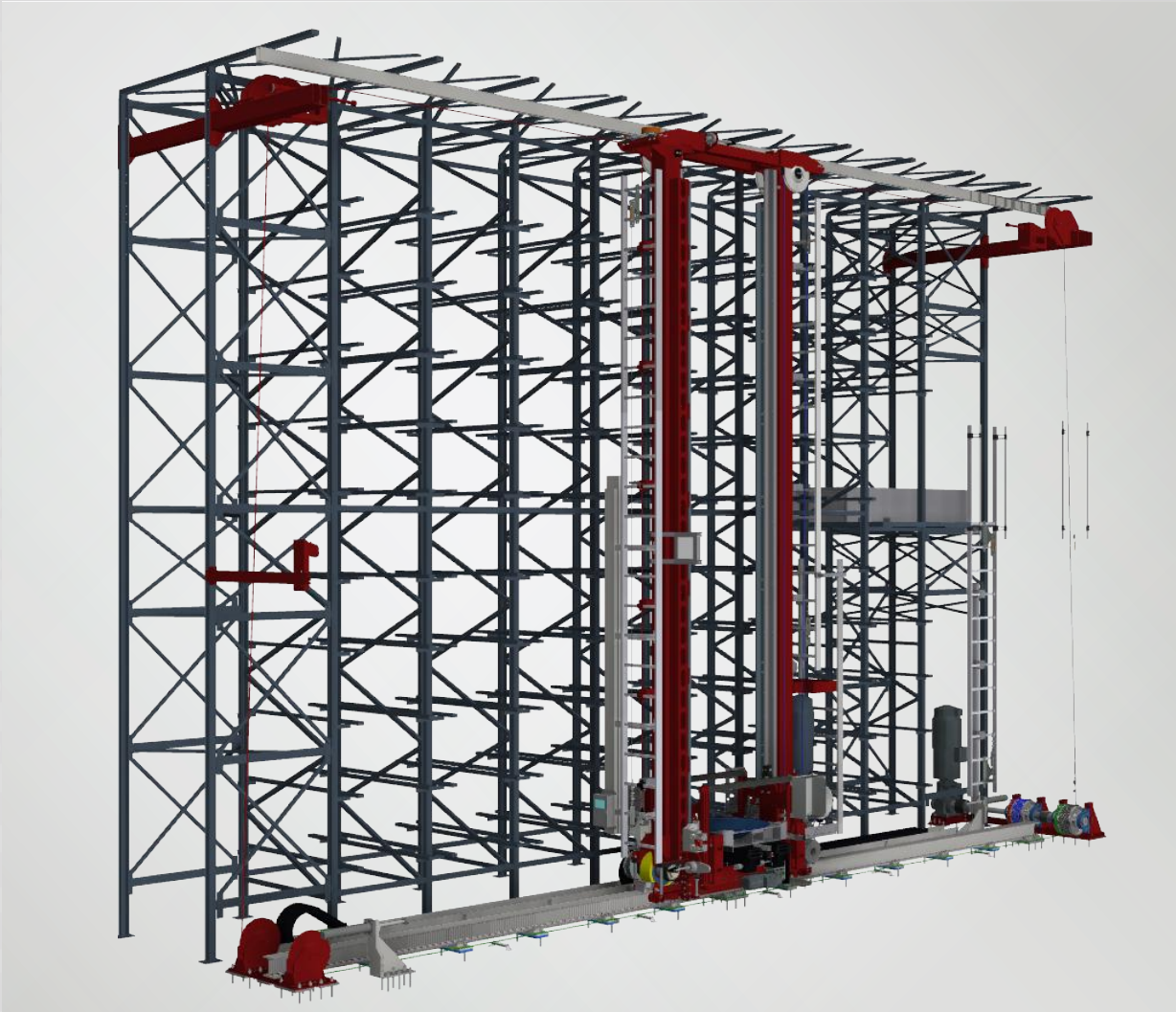
Single Mast

Double Mast

## » Miniload Stacker Crane Single Mast



## **GREEN TIRE STORAGE** **with *CARTESIO VX***



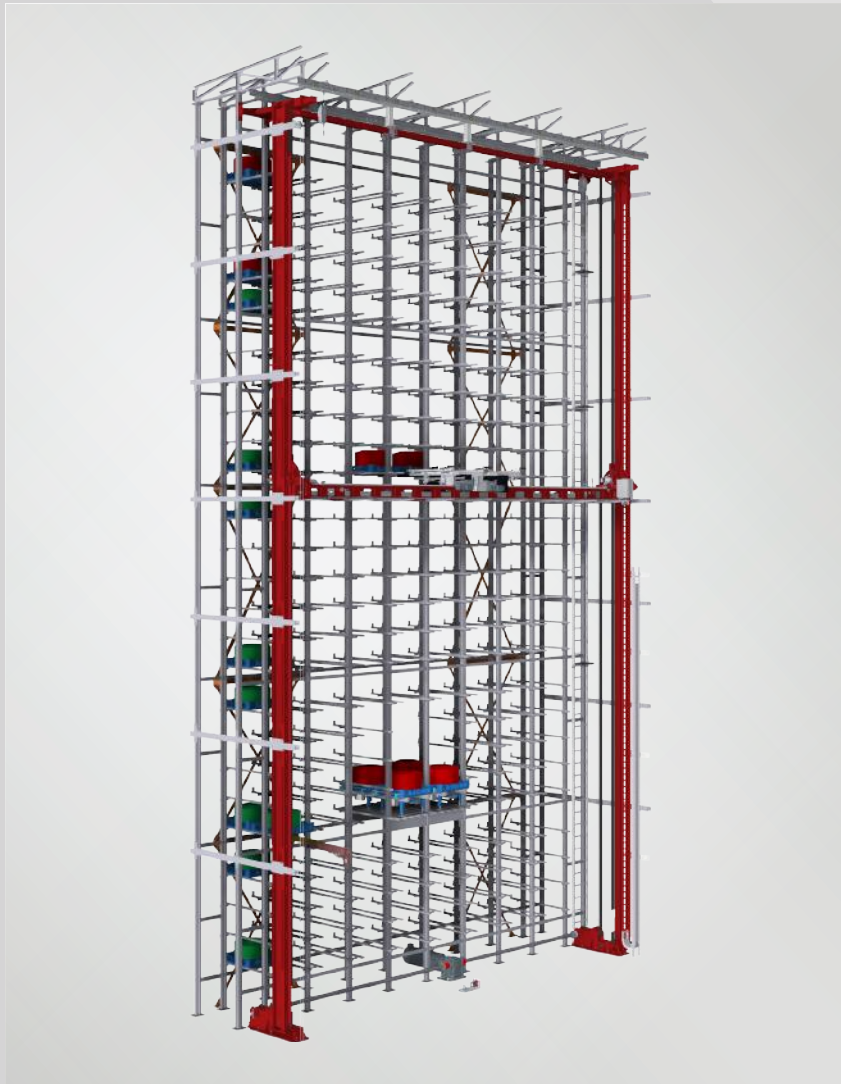
The Green Tire automatic warehouses with Cartesian and Cartesian VX are the ideal solution for brownfield applications, where plants with narrow or poorly distributed spaces require the maximum capacity to be obtained in terms of Green Tire quantity stored and flows.

The Cartesian system perfectly adapts to high throughput in very narrow spaces (maximum width up to 9.5 metres).

The Cartesian VX system, also optimised for narrow spaces, is instead an optimised solution in cost/benefit terms for lengths under 20 metres



# GREEN TIRE STORAGE with **CARTESIO**



## *Picking system*

*GT without tote/pallet*



*CROSS  
TELESCOPIC  
FORK*

*GT with tote/pallet*



*STANDARD  
TELESCOPIC  
FORK*

## *Load Configuration*



*SINGLE LOAD UNIT*



*2 LOAD UNITS IN LINE*



## **GREEN TIRE STORAGE WITH MULTI-LEVEL SHUTTLE (MLS)**

The new storage system, called the Multi-Level Shuttle (MLS), is formed by compact, single mini stacker cranes, however offering high performance, which can be stacked in the same lane, increasing system throughput. Cassioli's MLS was designed for storage of different types of materials and products, from Green Tires to finished tires. In an automatic warehouse with single or double depth, the Multi-Level Shuttle works on specific storage shelves and is presented as a shuttle with light design, capable of reaching higher performances than traditional stacker cranes for storage/retrieval. Having various shuttles on one another available means more flexible configuration is possible of the warehouse and the modularity of the system allows its development based on needs, the production potential required by the client and the type of product to handle.







## Picking system

GT without tote/pallet



CROSS  
TELESCOPIC  
FORK

GT with tote/pallet



STANDARD  
TELESCOPIC  
FORK



## Load Configuration



SINGLE LOAD UNIT



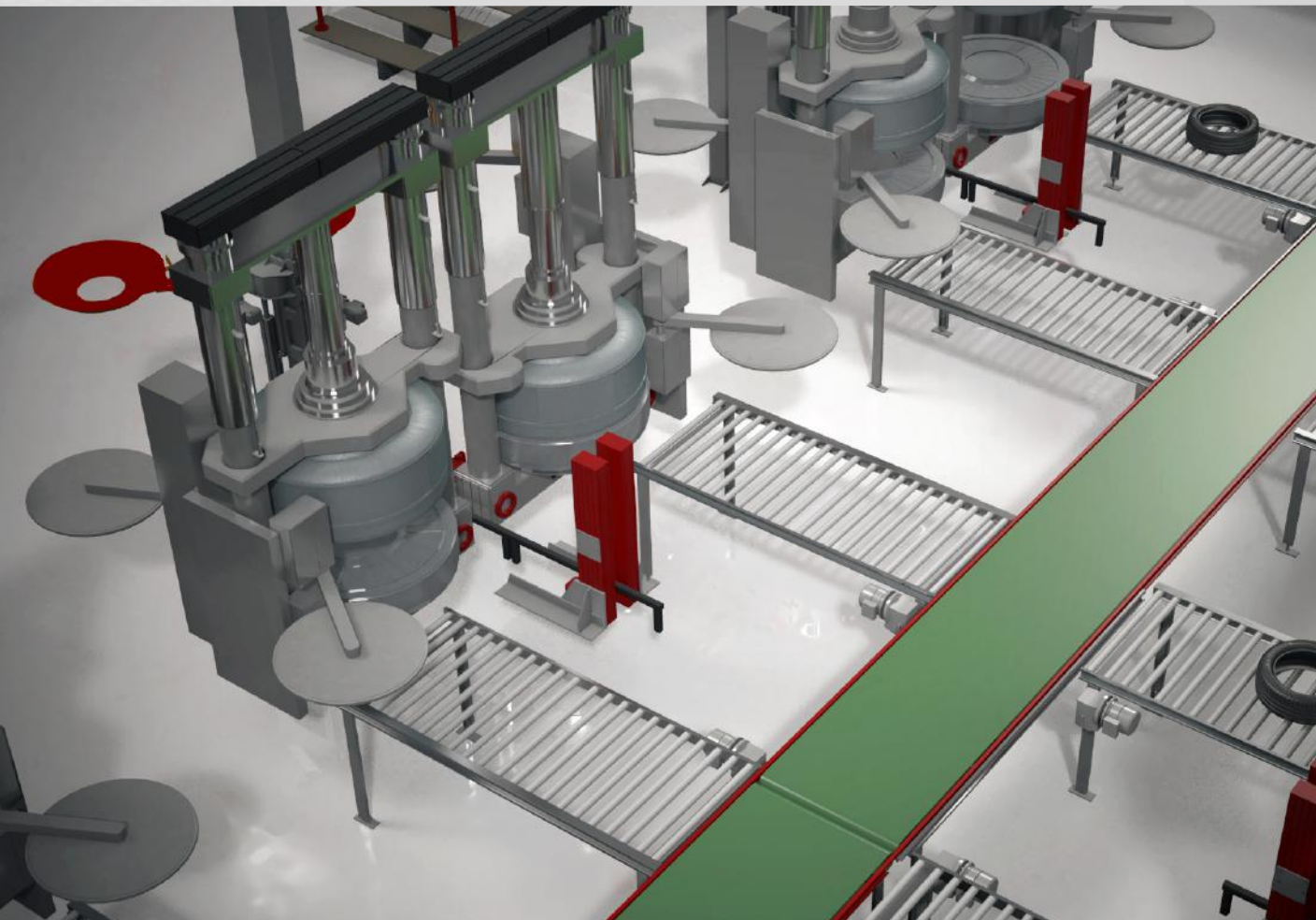
2 LOAD UNITS IN LINE



The compact design and the reduced weight contribute to making the system more dynamic, guaranteeing greater production capacity, with a high storage density, high efficiency from an energy point of view and low maintenance costs. Like all Cassioli systems, the Multi-Level Shuttle is managed by software developed inhouse, equipped with a simple and intuitive interface and capable of interacting perfectly with the client management software.

# 03

## CURING AREA



The vulcanisation process is used to obtain the final shape of the tire and the design of the tire thread. Vulcanisation is carried out in the press areas, using heat and pressure in tire moulding. When the Green Tire is called to feed the presses, the tires are treated in the painting machine, designed for painting green tires, both inside and out, with special emulsions that enable easy Green Tire detachment following vulcanisation in the press.

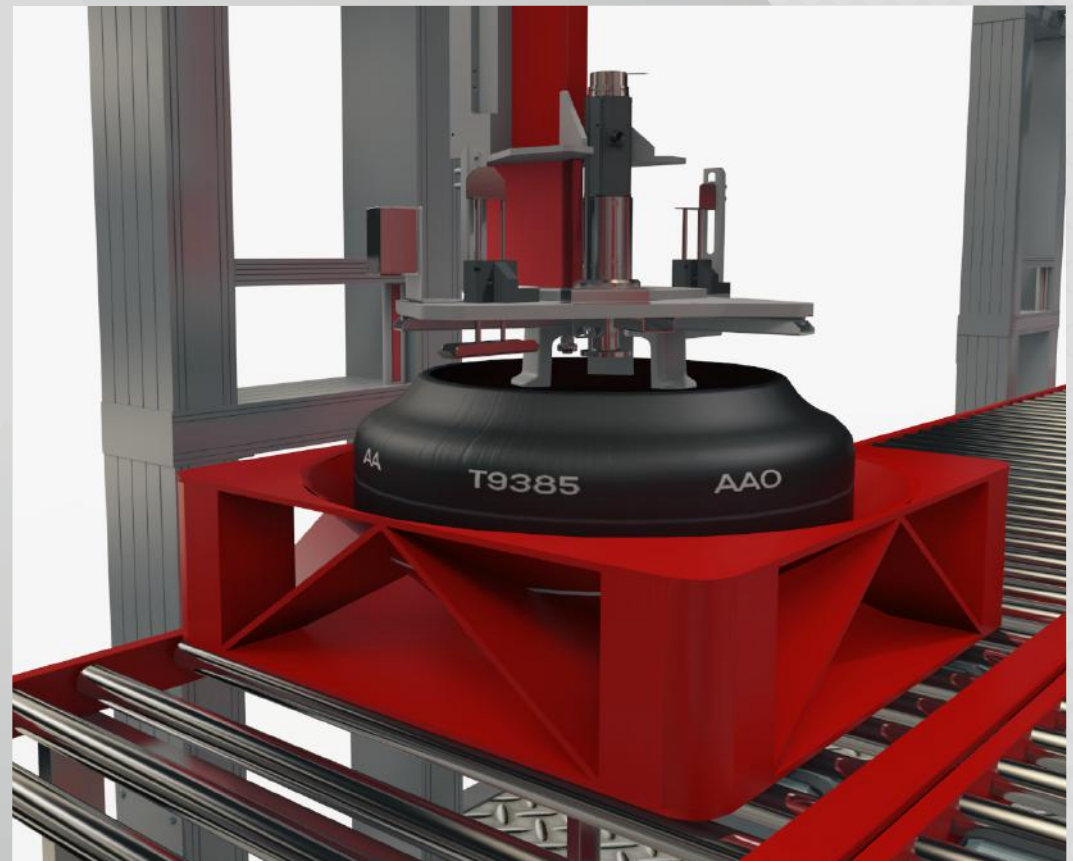
Cassioli systems can interface with the spraying machine to manage various spraying compositions and to exchange information on process results.

## ***PAINING/DOPING SPRAYING MACHINE***



## ***GREEN TIRE ANGLE CORRECTION MACHINE***

After being treated by the spraying machine, the Green Tires pass through the Angle Correction Machine: this, through the aid of a handling unit and a barcode reader, rotates the Green Tire and prepares it at the correct angle position for the presses.





## EMS

### [ELECTRIFIED MONORAIL SYSTEM]

Using the conveyor system, the Green Tire exits the ASRS and reaches the press feeding area. Here, it is picked by the EMS using a specific gripper that holds the tire and lifts it inside.

The EMS is an automated shuttle capable of travelling any route along an overhead track. The machine is composed of a frame, two wheel units, one automated and the one idle, a lifting device, a fall-stop device and an electric box.

The shuttle can fully automatically manage different tire measurements and interface with different press types. The GT pick and place phase requires ascent and descent movement of the gripping clamp obtained using four cables.

The absolute flexibility of the shuttle allows unloading of the tire at different heights, thereby managing to feed the most wide-ranging press loading devices (revolving unit, tilting unit, conveyors, etc.).



The track is supported by specific portals designed and dimensioned to allow open access to forklifts for mould change operations. Through automated exchange, the shuttle can be positioned in a specific maintenance area, which will allow the operator to intervene without interrupting or obstructing the functionality of the entire system.



## INTERFACE EQUIPMENT BETWEEN EMS AND THE PRESS

Once the Green Tire has been picked up, the EMS reaches the curing area through the suspended tracks and then deposits the GT in one of the equipment interfacing with the presses.

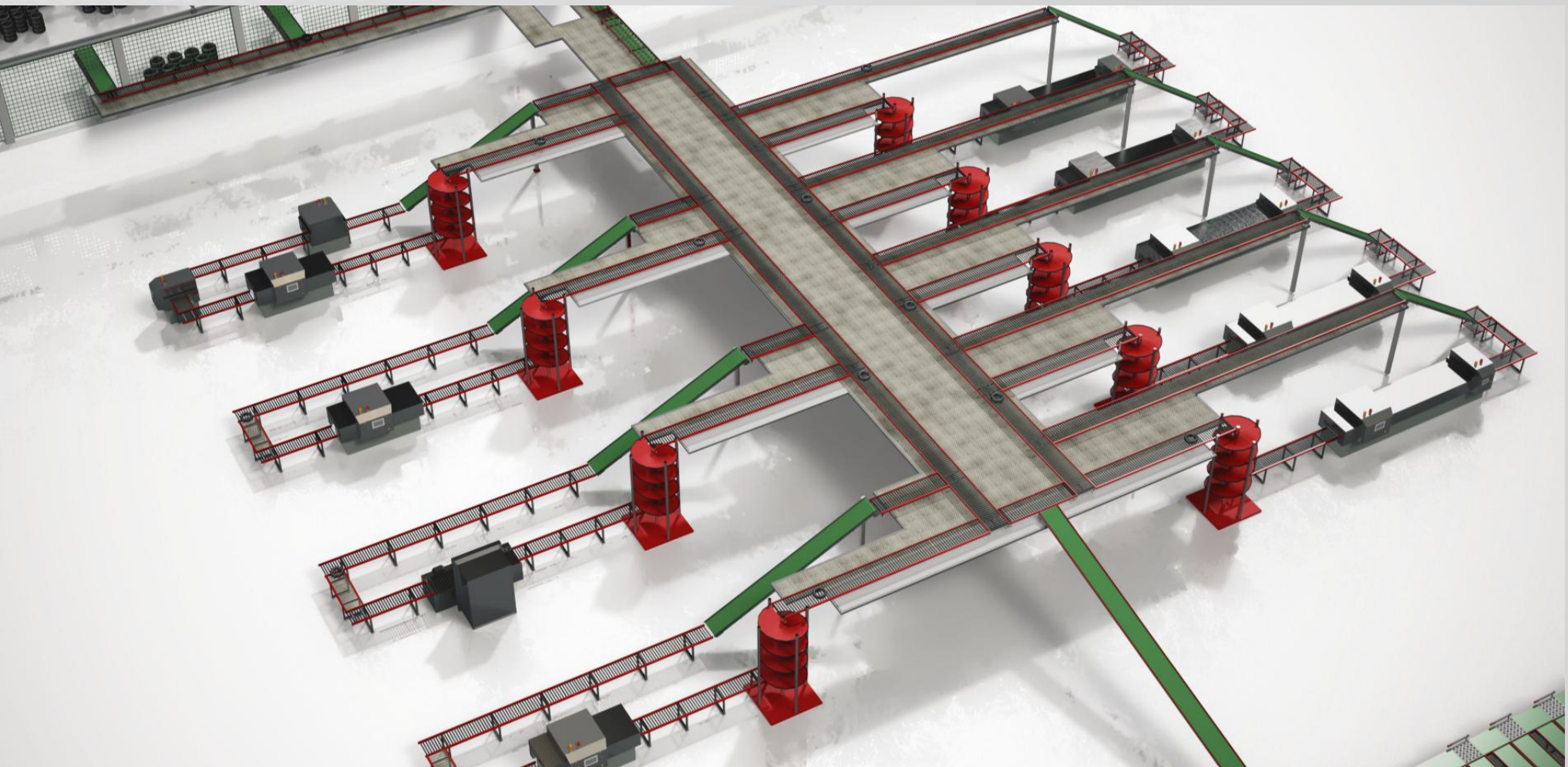
The interface equipment between the EMS and the press can be designed in different ways, such as horizontal and vertical revolving units, press pan, conveyors, trays, etc...

The feeding devices are designed to always have a minimum buffer for the press, so that the Green Tire is always available for the press as soon as the previous one has been loaded.



# 04

## QUALITY CHECK AREA



From the curing press, the tire is ready for the quality control phase. The conveyor system takes the tires to the manual inspection stations (visual control) and to the automatic quality control phase with special machinery (testing machines). Each manufacturer follows a specific set of inspection protocols and quality tests on products, in order to

verify that all the tires coming off the production line are free of damage and/or defects.

After the inspection bay, an automatic handling system transfers them to the storage and palletization area.



## BENEFITS

*Flexibility*

*High throughput  
and performance*

*User-friendly and  
safe maintenance*

## SYSTEM HIGHLIGHTS

### **CONVEYOR SYSTEM FOR FINISHED PRODUCT**

*Safe working environments*

*Space optimization*

*Flexibility in product handling  
and rapid transport*

### **SPIRAL CONVEYOR SYSTEM**

*Space optimization*

*Buffer increase*

*High throughput*

### **SOFTWARE INTERFACE WITH:**

*Testing Machine*

*Label Printer*

*Quality Inspection Area*



**05**

# ***PALLETIZATION & BUFFERING AREA***





From the inspection area, the tires are conveyed for storage and palletizing. Palletizing starts with the Gantry, designed and built to manage the tires for intensive storage.

The palletizing area contains several Gentries, that pick-up the tires that arrive in a random manner on the infeed conveyor

and stack them one by one on the floor, setting them in order according to the product code. Each Gantry has its own working area inside the storage area. Perfect management and safe machine control are ensured by the complete integration of the three fundamental aspects of automation: mechanical, electrical and

software management.

Since it is suspended off the ground, the Gantry is the ideal solution to best optimize space: this particular machine is designed to simultaneously manage several different tire sizes.

### **HIGH PERFORMANCE**

*The use of two synchronized servomotors enables the machine to reach sustained speeds and accelerations for the masses involved , in order to maximize production capacity.*

### **CARE OF THE PRODUCT**

*Thanks to its special design, the gripper can collect the stack of tires and safeguard the product quality.*

### **MANAGEMENT SYSTEM**

*The GMS software (Gantry Management System), part of the LOGIS platform, can manage the inputs and outputs from the storage area to supply information in real time for control and verification of the production process of every single tire.*

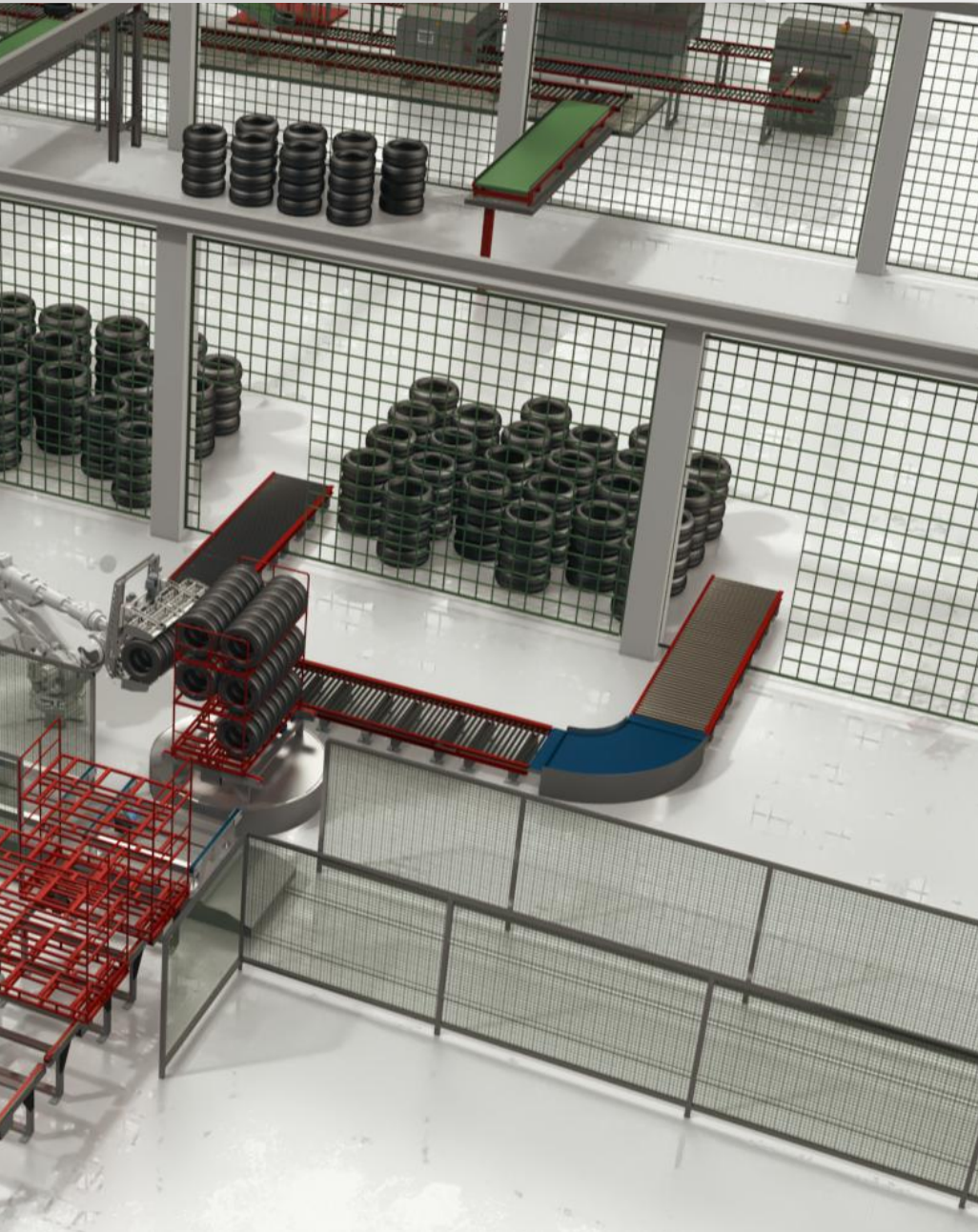
## **PALLETIZATION CELL**

Each palletization cell is equipped with a six-axis anthropomorphic robot, able to load two or more pallet stations; therefore, while the robot is loading one pallet, an operator or an automatic system can take the other complete pallet and reposition an empty one. The robot may be fitted with different types of grippers: double grippers for rick-rack palletizing, grippers for vertical palletizing and grippers for horizontal palletizing (on tread).

The operator works in safe conditions, because every palletization area is segregated with automatic doors and Safety Light Curtain.

In addition to the fencing, the robot has a certified double-check safety system.





## *PALLETIZATION SYSTEM*

*Horizontal*

*Vertical*

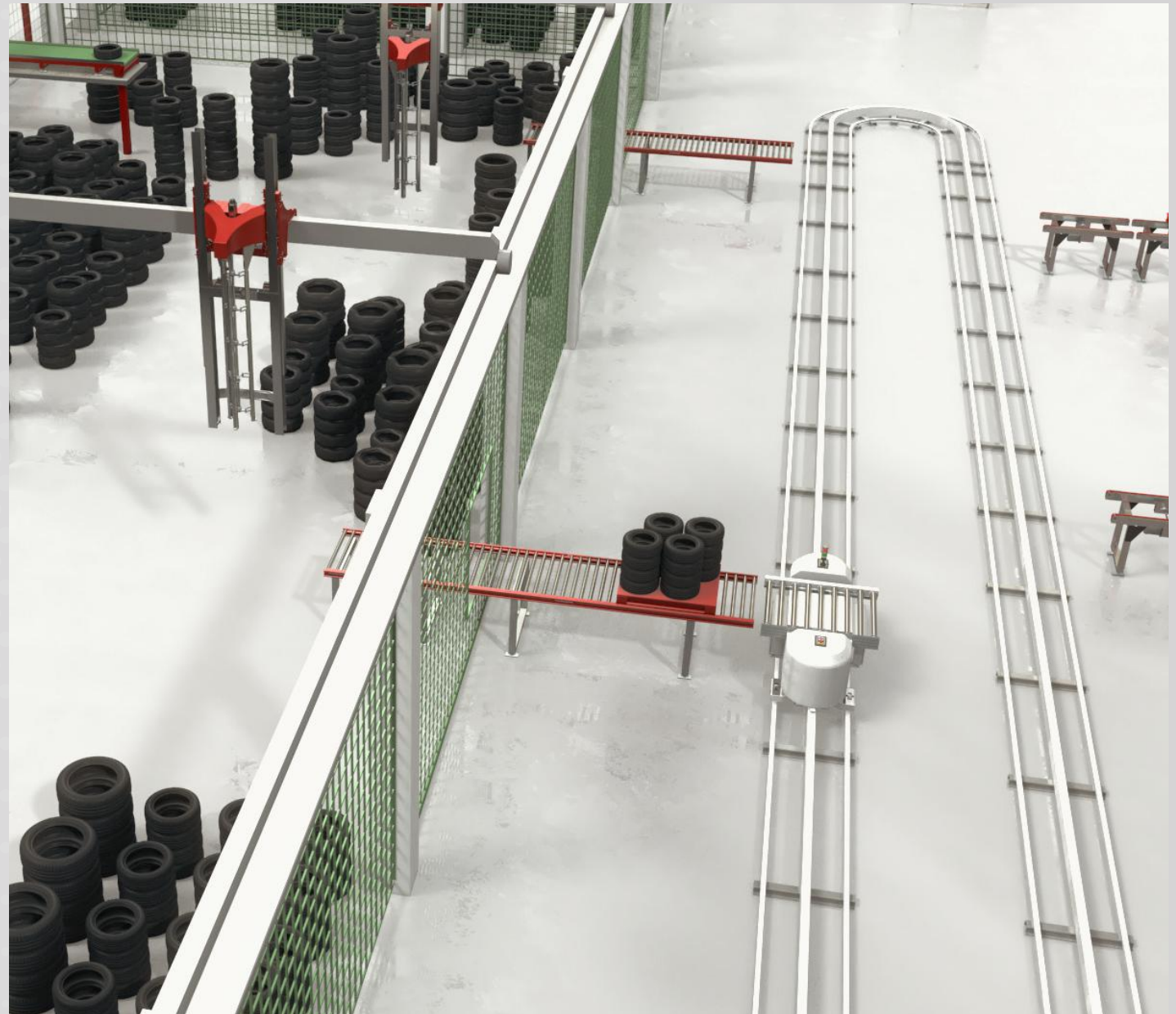
*Rick-Rack*

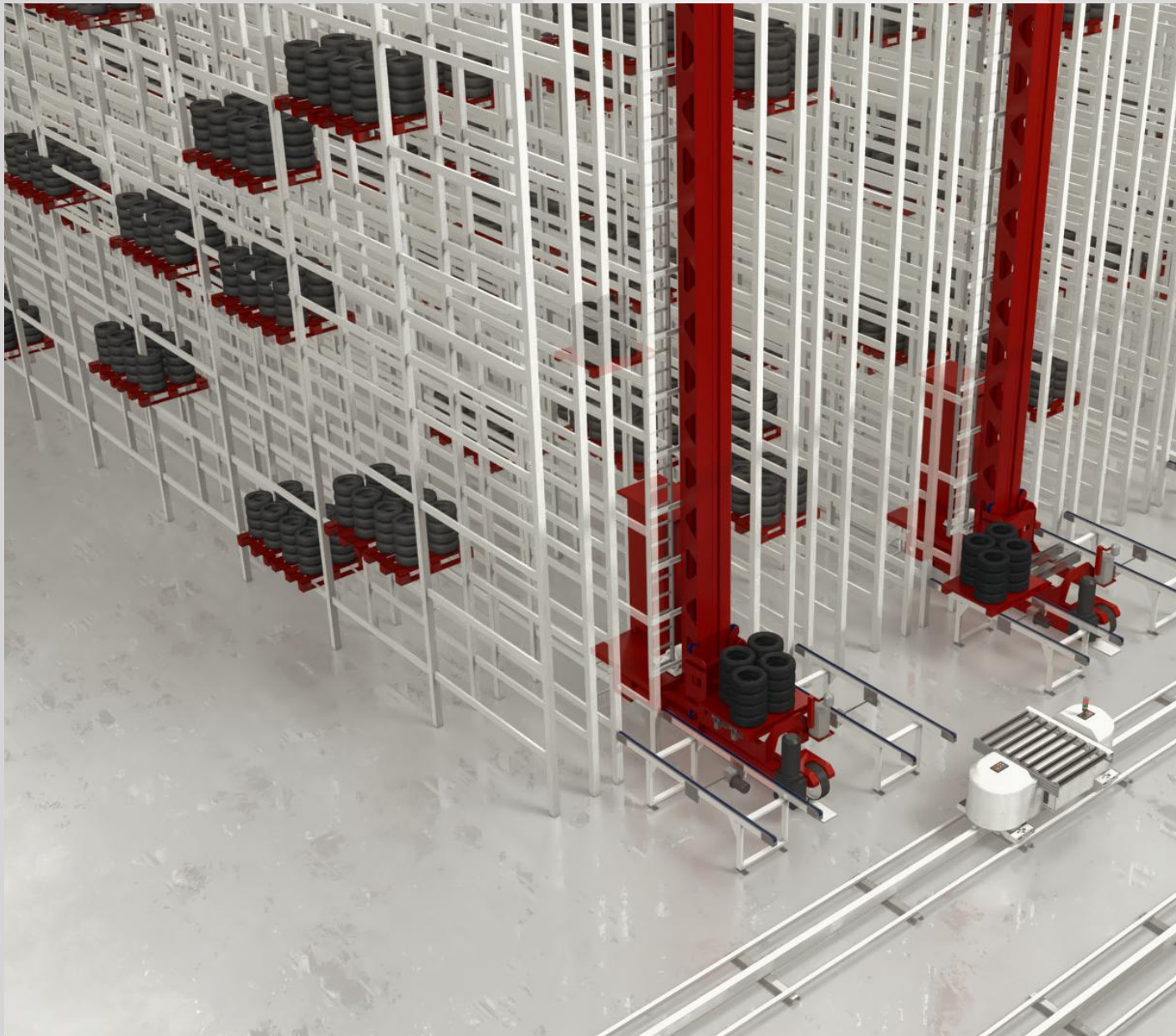


## **SHUTTLE LOOP SYSTEM (SLS)**

Cassioli's SLS (Shuttle Loop System) are composed of multiple self-propelled, steering shuttles that move on a closed circuit consisting of a track fixed to the ground.

Cassioli's SLS allow transport of the product from one part to another of the plant in a flexible manner, reducing the travelling time compared to a conveyor system.





## ***FINISHED PRODUCT STORAGE AREA***

After the pallet has been completed with the tires, it is taken to the Finished Product High Bay Storage, that can reach a height of 40 meters.

In fact, the finished tires have to be retrieved and delivered according to the customers orders and at the right time: with the Cassioli automatic storage areas, the tires can be stored and made easily available when it is necessary to retrieve them for shipping.



# INTEGRATIONS

## RAW MATERIAL STORAGE



The Cassioli storage unit for raw materials is the ideal solution to stock raw materials in an orderly and functional manner, so they are ready to be transferred to the mixing area.

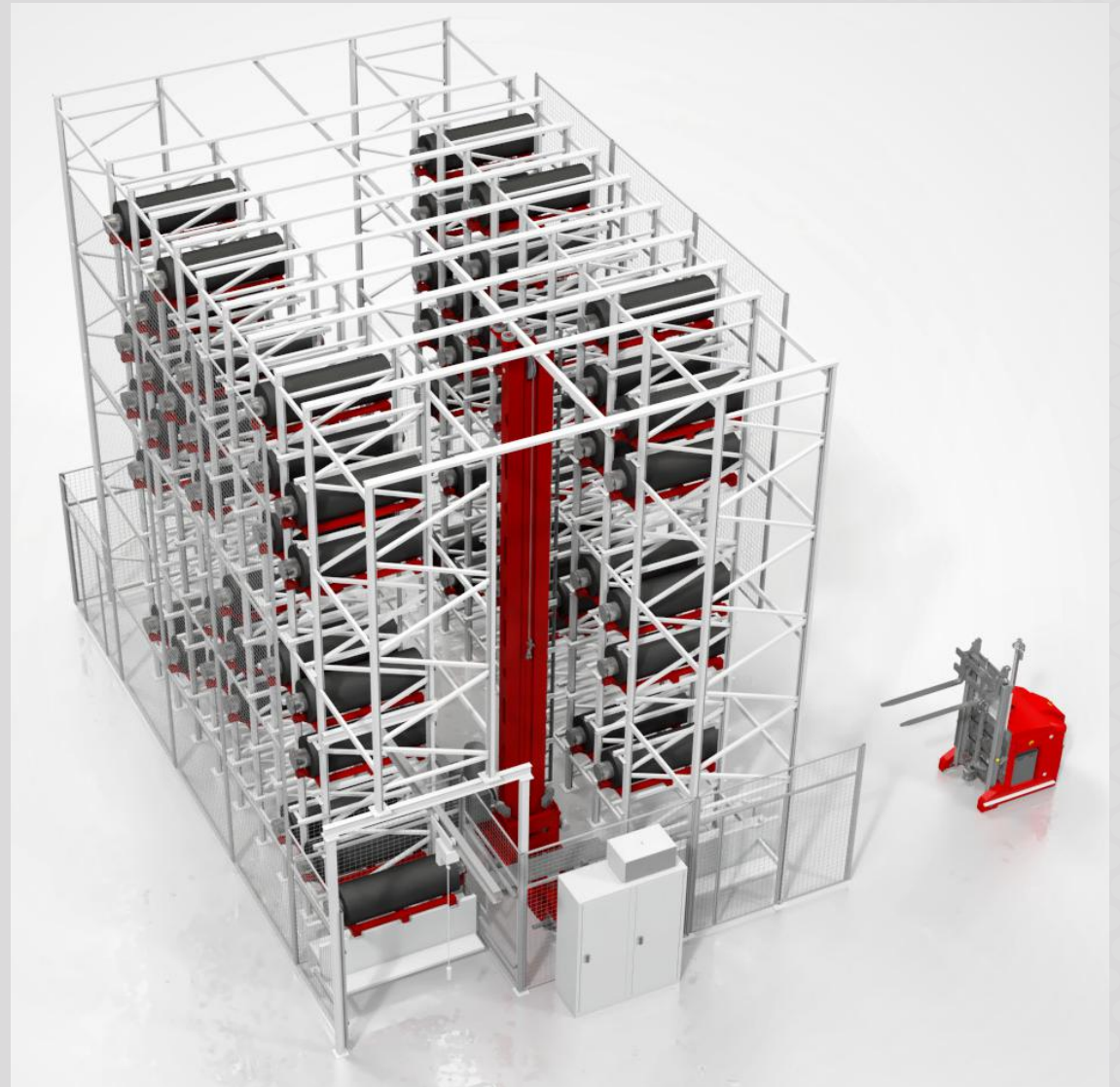
The storage unit is equipped with one or more stacker cranes to allow for an excellent storage of the raw materials and to facilitate retrieval of the same for the subsequent processing stages.

Our management system for the storage unit control efficiently manages the entire process flow, cataloguing the materials handled in detailed and ensuring full traceability of the loading units and inventory in real time.



## ***DRUMS STORAGE***

Automatic warehouse and retrieval system for drums on pallets. Cassioli's warehouse for drums enables rapid, safe and efficient warehousing of drums which will then be intended for the Tire Building Machine to construct the tires. The warehouse avails of one or more stacker cranes to enable easy movement of the drums, store them and prepare them for picking for subsequent process phases. Cassioli's management system for warehouse control manages the materials flow and ensure complete data management.



## **PCT BOBBIN STORAGE**

Cassioli offers complete automation technology for tire manufacturers, providing total control of the flow of material and precise data in real time for production and inventory management.

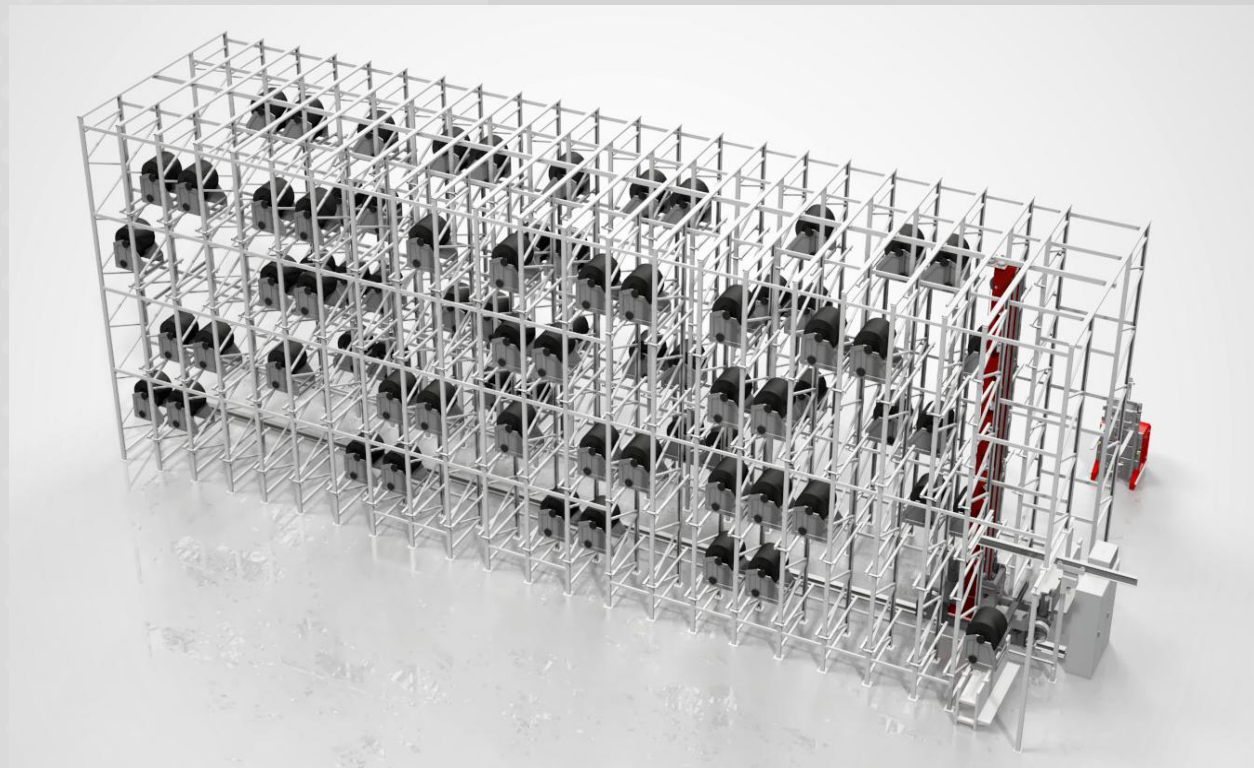
The PCT Bobbin storage unit is an automatic storage unit to stock the bobbins in which the rubber strips are coiled.

The incoming material is, in fact, a bobbin containing a strip of rubber called PCT (Pre Cured Tread), with a layer of polythene between each coil, called «liner», and loaded on a tray. Pallet and PCT are both identified by a bar-code on the PCT bobbin.

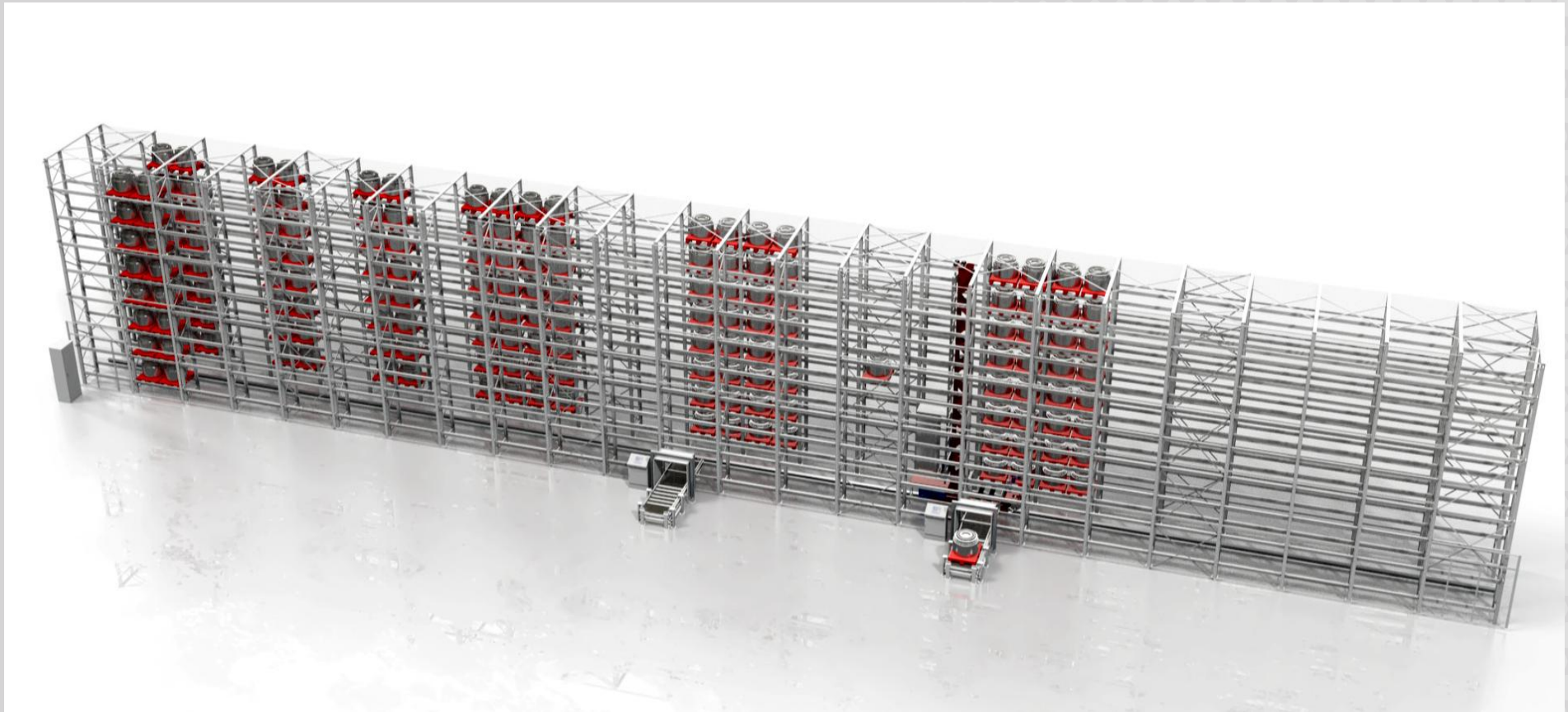
## **CASSETTE STORAGE**

The Cassioli systems are also designed to handle and store specific trays (cassettes) for the production of the tire's inner liner. The Cassioli automatic storage unit for cassettes ensures low operating costs and rapid access, avoiding standby times during production, and

facilitating a continuous production flow. As in the other automatic storage units, in the cassette automatic storage unit, one or more stacker cranes deal with the handling, storage and retrieving the cassettes.



## ***MOLD STORAGE***

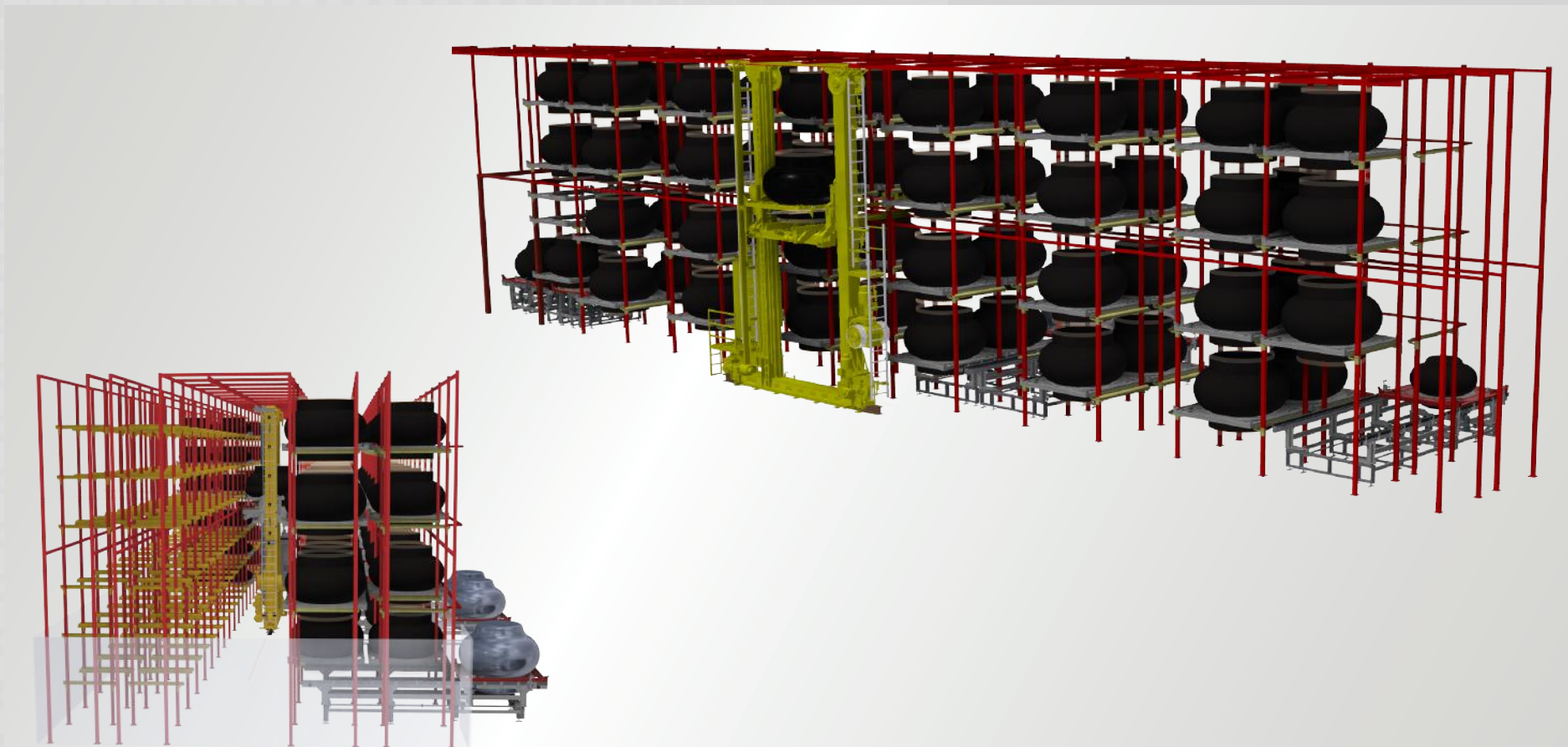


The Cassioli molds storage units are automatic storage units to stock and retrieve units composed of molds and other parts (side walls) placed on metal pallets. These storage units have one or more stacker

cranes and a management system to store, set in order and retrieve the molds from the storage and correctly transfer them to the curing press.



## ***GREEN TIRE AGRO / OTR STORAGE***



The Cassioli storage units for heavy tires for agricultural machines can store large-sized tires in a practical, orderly and functional manner.

The Cassioli automatic storage unit for Agro Green Tire (AGR Tire)

has one or more stacker cranes for excellent storage of tires for tractors, trailers, building trade machinery and much more, facilitating tire storage and retrieval.

## ***AGV (Automated Guided Vehicles)***

An AGV/LGV system is a flexible way to handle loading units with a high level of automation. The Cassioli AGV system ensures complete integration with the customer's high level IT system (customer's Host, departmental system, SAP, etc...) and with other handling systems or devices.

The AGV may be equipped with natural navigation or laser navigation (LGV).

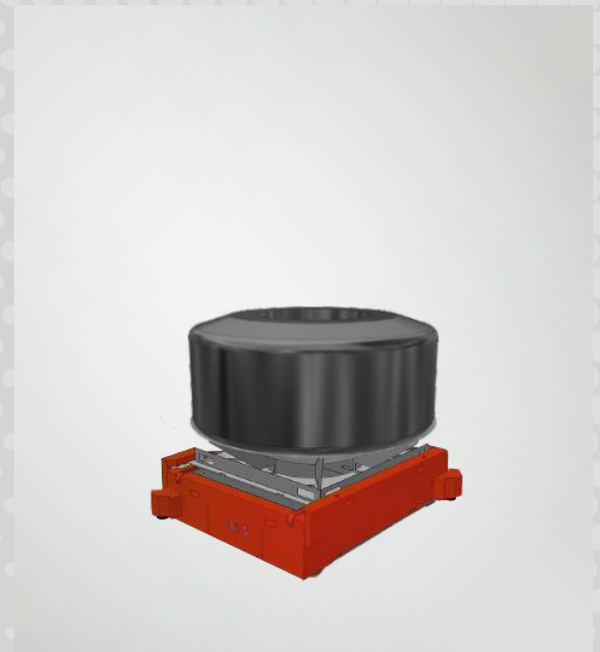
### ***STANDARD LGV FOR MATERIAL HANDLING***



### ***SPECIAL AGV FOR AGRO GT***



### ***AMR FOR TRUCK GT***



# ***DISTRIBUTION CENTERS***

## ***AUTOMATION IN TIRE DISTRIBUTION CENTERS***

Growing market demand is increasingly pushing more Tire Distribution Centres towards innovation which includes the changeover from semi-automatic systems to fully automated systems. With an internal research and development department dedicated to designing specific automated systems for tire distribution centres, Cassioli has designed, manufactured and patented automatic systems capable of considerably increasing production and storage capacity, significantly reducing the number of errors compared to semi-automatic systems where manual operations are far greater and more complex than fully automated systems.

Cassioli systems can carry out the following operations in a fully automated manner.

- Identification and control of the tires entering the system;
- Storage inside the automatic warehouses specifically designed to optimise space saturation;
- Fast and reliable recovery system of the goods to dispatch, taking account of the analysed outbound flows;
- Automatic labelling systems, which are completely customisable;
- Loading systems of ergonomic devices and simple management.







Cassioli is a world-wide leader in the industrial automation sector. The experience we have accumulated over the years allows us to find the best compromise between operating needs and costs. The Cassioli systems include many services, such as, design of the layout based on the specific customer needs, system verification, operator training and guaranteed assistance. We offer complete solutions for the Tire sector, with systems equipped

with all the devices necessary for a rapid and prompt work flow. The Cassioli software provides overall material and process control, providing real-time data necessary for production and stock management.



# GLOBALLY PRESENT LOCALLY INVOLVED

CASSIOLI is an international group, providing plant engineering solutions for industrial handling and automation. With 4 different production plants, offices and commercial partners spread out over the world, Cassioli is divided into 5

divisions: Intralogistics Division; Manufacturing Division; Airport Division; Tire Division, Service Division. Whenever it is necessary to transfer or handle finished products, semi-finished products, component kits or raw mate-

rials in a more or less automatic manner, CASSIOLI can provide the transfer or storage systems that are most suitable in terms of operating capacity, cost, safety and ergonomics.



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